

C. Remarks

1) Election/Restrictions

Applicant confirms the election made on February 28, 2005 to proceed with examination of Claims 1-12 and to withdraw Claims 13-28 from consideration. However, Applicant wishes to traverse that restriction on the bases of both the classification of the four Examiner-defined inventions and on the allegations of their separate utilities.

a) Classification – All four of the originally filed independent claims describe either apparatus for or method of using a capacitive sensor to measure a distance along a sensing body, which is generally consonant with the definition of class 324, subclass 662. Moreover, all four provide for a comparison or difference circuit for matching two capacitive quantities in order to determine their relative values, a recital falling within the scope of class 324, subclass 679. Both 324/662 and 324/679 are indented under class 324 subclass 658. Thus, although it appears that all four independent claims should be classified into 324/662, any or all of them could be put into any of the three subclasses selected by the examiner. The Examiner has presented no rationale for selecting different ones of the three subclasses for different ones of the four sets of claims. Applicant believes the selection to be arbitrary and unsupported.

b) Utility – All of the originally filed claims describe essentially the same utility – that of measuring distance along a sensing body extending between two electrodes. This utility is recited in the first line of all four of the independent claims. This utility is provided by various combinations of claim elements. In his restriction requirement the Examiner describes these combinations of features as ‘utilities’, which appears to be a clear confusion of means and ends. If that were adequate reason for restriction, then all applications would be restricted to a single independent claim, which is contrary to US practice.

2) Information Disclosure

A German-language document (EP 0 711 978 A2) was not considered because no translation was supplied. This reference was supplied after being cited as background material in a PCT search report, which listed the abstract and drawing as being relevant. A copy of an English-language abstract is supplied herewith and consideration is requested (The Commissioner is hereby authorized to charge the

undersigned's Deposit Account 50-1012 therefor).

As indicated in said English-language abstract, the measurement approach taught in the cited reference involves obtaining two time-sequential distributions of a supply voltage across a voltage divider. This is in clear distinction to the present invention, which teaches simultaneous actuation of two separate channels.

3) Claim rejections under 35 USC §103(a)

The Examiner argues that in US 6288707 Philipp (hereinafter Philipp707) teaches all of the limitations of claim 1, except for the feature of each channel having a non-linear response. The Examiner goes on to state that this feature is known from Allen (US 5914465, column 11, lines 7 to 19), and so claim 1 is obvious. Applicant does not agree with this view.

Philipp707 describes position sensors of the kind having capacitance measurement channels at the boundaries of a resistive sensing body. Philipp707 employs capacitance measurement circuitry similar to that described by Applicant in US 5,730,165. This type of circuitry provides a linear response. This is because, referring to Figures 8 and 9 of Philipp707, a sense capacitor (60) whose capacitance C_s is to be measured is charged to saturation by a supply voltage V^+ (column 11, lines 38-39). This leads to a charge Q_x being placed on the sense capacitor. This charge is linearly proportional to the capacitance C_x (since $Q_x = C_x * V^+$). It is this charge that is measured by the charge measurement means 64 to provide an output signal. Thus, the output signal of Philipp707 is linearly proportional to the capacitive load C_x . Accordingly, and as recognized in the Office Action, claim 1, which clearly recites non-linear responses, is not anticipated by Philipp707.

The present invention lies in the surprising realization that in a position sensor having measurement channels at respective ends of a sensing body, a linear position output can be obtained from a linear combination of output signals from measurement channels having individual non-linear responses. This surprising result is described in paragraph 0061 and shown in Figure 4 of the present application. The inventor's realization in this regard is important because measurement channels with non-linear responses are generally simpler and easier to fabricate than those with linear responses, yet it is not at all obvious that non-linear measurement channels can be used to provide a linear position output without additional complex processing.

The Examiner states that Allen discloses measurement channels having non-linear responses and so it would be obvious to modify the device of Philipp707 to use such non-linear channels. However this is not a combination a skilled artisan would adopt because Allen describes a device that operates in a manner fundamentally different from that of Philipp707.

Philipp707 employs measurement channels at the boundaries of a resistive body. The position of a touch along the resistive body is in effect interpolated from these measurements. The skilled artisan reading Philipp707 would appreciate the significance of the linearity of the sensing channels to the interpolation process and consider this necessary for proper operation of the device. Indeed, even Allen explains that linear responses are required for proper operation of sensors relying on interpolation (column 4, lines 1-6).

Allen, on the other hand, describes a device that does not rely on interpolation between measurement channels at either end of a sensing body, but rather employs a series of closely spaced, but separate, sensing electrodes arranged across the whole of the sensing area. Each electrode is coupled to a separate measurement channel. Allen does not rely on interpolation but instead simply determines a weighted average of each of the electrodes' separately-measured coupling to an object adjacent the sensing area. With this different approach the response function of the sensing channels is not so relevant because all that Allen requires to form his centroid is some measure of the relative coupling strengths among neighboring electrodes.

In summary, the skilled artisan reading Philipp707 would not consider the teachings of Allen to be applicable because Allen relates to a fundamentally different type of position sensor. Furthermore, even if he were to look to Allen, he would only find that it reinforces his view that linear sensing channels are required for position sensors based on interpolation (see column 4, lines 1-6 of Allen). Accordingly, it is not obvious from Allen to modify Philipp707 to use non-linear sensing channels because Allen specifically teaches that such a combination is inappropriate. Thus, claim 1 is not obvious over the prior art of record. Moreover, Claims 2 to 12 are novel and non-obvious at least by virtue of their dependency on claim 1.

This argument is believed to traverse the Examiner's rejection of Claims 1-3, 7, 9 and 12 under 35 USC §103(a) over Philipp707 in view of Allen; of Claims 4, 5, and 8 over Philipp707 in view of Allen and

Philipp2 (US6466036); of Claim 6 over Philipp707 in view of Allen and Haase; of Claim 10 over Philipp707 in view of Allen and Brandt; and of Claim 11 over Philipp707 in view of Allen and Bloom. Reconsideration is requested.

4) Conditional amendments

Applicant notes that each of the three independent claims in the set of currently withdrawn claims describes a respective example of specific circuitry for providing non-linear responses. Although the non-linearity is inherent in the apparatus and methods recited in Claims 13-28, these claims, as filed, did not explicitly mention that fact. In view of the importance of this feature, Applicant herewith provides an explicit statement of non-linearity in conditional amendments to currently withdrawn Claims 13, 18 and 24, and requests that said amendments be considered should the restriction requirement be traversed and Claims 13-28 be rejoined.